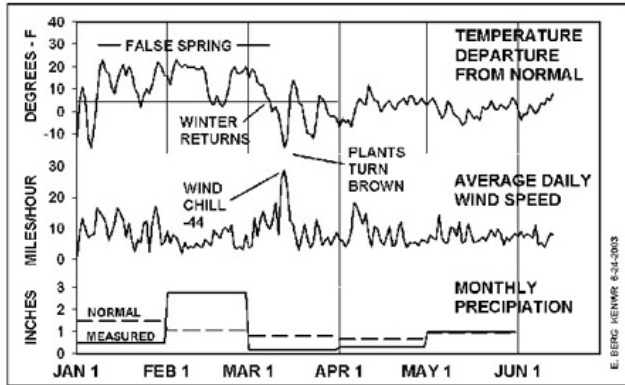


Why has the Labrador tea turned brown this spring?

by Ed Berg



Spring weather recorded at the Kenai Airport.

Many plants suffered frost damage from strong Arctic winds in mid-March, which followed an eight-week period of temperatures reaching more than 20 degrees above normal.

Have you noticed the brown halo above the ground along many Peninsula roads this spring? Our forests typically have a low shrub layer of Labrador tea with permanent green leaves, but many of the leaves are brown this year. This dieback can be seen very dramatically driving along Funny River Road, for example, especially on the south side of the road where our fire crew has thinned the spruce forest to create a firebreak.

Lowbush cranberries (lingonberries, mountain cranberries), leatherleaf, club moss and crowberries are also showing some brown leaves, although not as badly as the Labrador tea.

Plants exposed to the wind (north-facing open slopes, open powerline right-of-ways, treeless bogs) were more affected than the same plants in protected settings (south-facing slopes, in deep protected woods, etc.). Even on small mounds the leaves of evergreen plants on the north side were affected, but two feet away on the south-facing side the plants were OK.

As I said, all of these plants are evergreens, meaning that they do not drop their leaves in the winter. Although the leaves have died back this spring, the plants themselves generally do not appear to have been killed. The green parts are producing flowers,

and the dead leaves will probably be replaced over the next few seasons.

We have a key observation on this puzzle. Our former refuge supervisory biologist Ted Bailey retired two years ago, after 24 years on the refuge, and he now indulges himself by taking an extended daily walk. He keeps a daily journal of the walks, recording his observations on the comings and goings of wildlife, the plants, and the weather. This kind of daily record becomes extremely valuable over the years, and we wish Ted Bailey a long and healthy life as a chronicler of our changing environment on the Kenai. (Watch for Ted's upcoming *Refuge Notebook* on the daily work life of a red-breasted nuthatch family this spring.)

Ted Bailey's key observation is that the plants turned brown after a blast of cold arctic wind on March 12th, 13th and 14th. This windstorm closed the Anchorage airport and damaged many buildings in Anchorage. Wind chill values at the Kenai airport were -37°, -44°, and -40°, respectively, on those days.

The browned plants would normally be under snow cover and would thus be protected from extreme cold and strong winds, but this year there was very little snow cover at the lower elevations and the plants were fully exposed to the cold winds.

Even so, these plants are tough. They have evolved in a harsh winter climate, and all survive much more extreme winters in the Interior than we have on the Kenai. What was so peculiar about this particular cold period in March?

My hypothesis on this dieback is that the eight-week long "false spring" (from Jan 9th through March 8th) caused the plants to break winter dormancy. The plants relaxed too much and thought that summer was just around the corner. During this period in Homer, we had domestic flowers blooming in the garden and grass was greening up. (Native wildflowers, however, knew better.)

February was the warmest on record at the Kenai airport (which began recording weather in 1944), with the February average 31.4°F, as opposed to long-term mean of 16.6°.

Northern plants have various mechanisms of winter dormancy that harden their tissues against the cold.

In the first stage of hardening, water is moved out of the cells into spaces between the cells, so that ice crystals will not damage the cell membranes. In the second stage of hardening, the chemicals in the cell membranes are reorganized to be stable at lower temperatures. In the third stage of hardening, the water between the cells is frozen to non-crystalline glass-like form that does not have sharp points. These hardening phases must take place over several weeks, and the degree of hardening varies greatly from species to species. In the extreme, some tree species—properly hardened—can be dipped in liquid nitrogen at -321°F and still survive.

When a plant is warmed over a period of days, the hardening stages are reversed. Simply bringing the plant into a warm room is not sufficient to instantly break winter dormancy, but eight weeks is more than adequate. Our many days of maximum temperatures in the 40's during January and February should have been more than sufficient to initiate the de-hardening process. In a word, these plants were caught “with their pants down” when the cold arctic winds arrived on March 12th.

A similar “false spring” story comes from the Colorado Rockies. In 1989 a January thaw lasting six days (with mean maximum temperatures of 43.5°) was followed in February by a cold snap where temperatures plunged to -29°F for two nights. This caused needles at the end of lodgepole pine branches to die and turn red.

Many people have planted lodgepole pine on the Peninsula, and I would be curious to know if readers

have noticed any red-needle dieback on their lodgepoles, especially if their Labrador tea plants and other evergreen plants also turned brown.

In the Colorado case the extreme cold was sufficient to kill the de-hardened needles: wind wasn't a factor. In our case the air temperatures were relatively mild ($+1$ to 5° daily minimums), but the high winds presumably lowered the leaf temperatures well below the air temperatures. The wind chill calculation attempts to capture this cooling as it would affect human skin, and it is hard to say exactly into what temperature a wind chill of -44° translates for the inside of a Labrador tea leaf. Whatever that temperature might be, it's a good bet that properly hardened Labrador tea would have been able to withstand it, and that the problem this spring was the loss of proper hardening with the long “false spring.”

Information for this article was drawn from *Winter: an Ecological Handbook* by J. Halpenny and R. Ozanne (Johnson Books, 1989).

Mark your calendars for August 2, 2003, when Kenai NWR and Alaska Maritime NWR host a Centennial Celebration of the National Wildlife Refuge System. The event is free to the public at the Alaska Fairgrounds in Ninilchik and lasts from 10 a.m. to 8 p.m. Attractions include speakers, movies, displays, and kid's activities sharing Alaska's refuges and wildlife. Live music and delicious food will also be provided.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.